ABSTRACT OF TAPE MADE BY DOUG PERHAM AND ERV RASMUSSEN

July 12, 1963

TAPE 5, SIDE 1

Wollensak Index

THE EIMAC STORY

1 Interview with Jack McCullough, Bill Eitel. Biographical data on each. Eitel received amateur license in 1924. Eitel to work for Heintz and Kauffman making receivers, Jan 1, 1929. That Spring, Heintz started making own tubes; Eitel put in charge. McCullough joined in 1930. These two amateur radio friends formed own company Sept, 1934.

66 Heintz' company built entire wireless system for Globe Wireless in 1929-1930. Effects of depression on Heintz and Kauffman.

89 Steps leading to formation of Eimac. E and Mc making tubes for amateurs. Carl Porter from H & K was first employee. Walter Prenty and Brad Harrison--their part in Eimac.

138 Eimac plants at Salt Lake City. First half million dollar contract from Western Electric for radar tubes in 1940. Eimac/have made more radar tubes than anyone in the industry. Employment during war at San Bruno and Salt Lake--from 20 to 3700. Training program.

196 Early days of Eimac. First orders from amateurs from ad in QST. Comparison of methods of manufacture of then and now.

250 Post-war years of Eimac. New products, tetrode series, other tubes. From 3600 to 250 people. Government dumped tubes on market as surplus. Use of early tubes in diathermy machines.

4-25A

286 Use of the 4250A in atomic subs for sonar system today--designed in the mid-40s.

294 Development of the first high power tubes. 1950--the klystron. Use of klystrons for ultra high frequency systems in England in the future. Eimac now making traveling wave tubes, voltage-tuned magnetrons.

354 Future of Eimac. Discussion of current "panic."

385 End of interview with William Eitel and Jack McCullough at Eimac plant in San Carlos.

THE LITTON STORY--July 15, 1963

394 Interview with Charles Litton of Litton Engineering Labs in Grass Valley. Biographical notes. Born March 13, 1904. Went to high school at Lick-Wilmerding in San Francisco--received both trade and college prep course.

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454 A discussion of the school policies of today and yesterday. Litton to Stanford, living in Redwood City. Litton a ham operator in 1914. Discussion of A.E. Bessie and wife, Phil Schofield, Tom Lambert, Otis Moorehead, Meyer, de Forest, Hyde, Fyte, Cunningham, Moorehead's first and second wife. ?
NEVER HRD OF SECOND WIFE

610 Moorehead Laboratories making tubes for de Forest and Marconi. Henry Shaw. An admiral, son-in-law of Spreckles, with Federal Telegraph Co. Elmer Cunningham, neighbors in S.F. of the Littons, introduced Litton to ham radio. Cunningham's store in S.F. Haller, Cunningham's partner, in 1908. RCA and Cunningham arrangement.

739 Litton to Bell Laboratories after Stanford. While at Stanford Litton and Schofield were ham buddies. Set on top of hill at end of Eaton Ave. Towers there 1923 until 1927. One of first to get in Australia and New Zealand contest. Blew own glass tubes. Made own generator, all parts. Bill Eitel bought one of their tubes. Professor Franklin at Stanford, Herbert Hoover, Jr. both hams at Stanford at this time, put together commercial radio system for aviation company, now TWA. Litton used Stanford facilities and planned to go into tube business.(Still has original
815 pumps--which he says he will give to the Perham Foundation.)
832 After two years with Bell, Litton works for Federal Telegraph, 1927. Studied tube patents, designed tubes. Nolte's patent. RCA, Westinghouse, AT&T clique controlled tube patents. Built 179° grid, anode, tube. Put Mackay Radio into competitive position. Other Federal tubes. Enameled tungsten used. Copper tubular seals. F.S. McCullough, a tube manufacturer, supplied tubes to Federal for a time. Not patent free, however.

1 First vacuum relay, developed at Federal. High power tubes. Housekeeper seal patented. Litton's answer to need for big diameter seal. Used by Federal until about 1934.

61 Litton's visit to RCA's patent attorney, who praised his seal. Mackay acquired Federal, then IT&T. Main office in New York, manufactured tubes in Newark, N.J. Federal Telegraph Co. in Buffalo, N.Y.-- but not the same as Federal Telegraph Co. in Palo Alto.-made a key switch for telephone companies.

124 Federal left Palo Alto in 1931-32. April 6, 1932 this Palo Alto branch of Federal finally closed down, when tube manufacturing moved to Newark. Litton started his own business then. $12,000 cash. Dr. Leonard Fuller had arranged a 5 year contract two years previously with Litton. George Lafee, general manager of Newark plant, reviewed the contract--later became Litton's general manager. Litton able to buy Federal's equipment at junk price. Litton then able to make amateur's tubes. Sick for a year. Sold Eitel and McCullough set of castings for a lathe. Helped them to get going.

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211 Pacific Coast type tubes for the amateurs developed by Litton. Herbert Hoover, Jr.'s interest. Litton made precision glass blowing machinery for the industry, still the main source of this in U.S. During Lend Lease days Litton was only source of glass blowing lathe. Consultant for Federal Telegraph.

300 Produced a klystron within 60 days of the announcement of the first klystron. Litton discusses the history of the klystron. Don Lippincott did the patent work on it. Litton's ideas on klystron in a notebook, which he gave to Stanford. Sperry in San Carlos bought this from Stanford, gave the $1,000 to Fred Terman for the lab. Federal began to build klystrons, after Stanford, but before Sperry. 12 or 14 patents issued to Litton.

347 Work in magnetrons--urged by Fred Terman, before the war. Litton went back to Federal's tube production facilities for two years. Developed a magnetron. Litton finds himself sole owner of a million and a half dollar concern. Sold it. Development of his present facilities in Grass Valley.

590 End of tape, side 1.

ABSTRACT OF TAPE MADE BY ERV RASMUSSEN

July 11, 1963, Palo Alto,Calif.

TAPE 5, SIDE 2

THE DR. LEONARD FULLER STORY

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1 Born in Portland, Oregon. Came to Palo Alto to work for Federal Sept. 1, 1912. Sacramento and Stockton stations were used for telephone demonstrations, making a triangle with San Francisco. Left Federal in fall of 1919. Back again with Federal in 1928 until 1932. Federal moved east in 1932.

34 Fuller with Colin B. Kennedy Co. Kennedy employed as an engineer with Federal when Fuller was in charge. Kennedy not a college graduate. With Federal in about 1915. Had been a Federal Telegraph telegraph operator. After World War I, Kennedy started company to build radio receivers with capital from Fuller. First year Fuller in east, later with the company. Started in bldg. at 140 Second St., S.F. Other wireless companies which were in this area.

78 Immediate market was radio amateurs. Emil Portal, an engineer, with Kennedy Co., formerly with Herrold. Kennedy Co. had an Armstrong regenerative license. Wagner Electric Corp. in St. Louis bought out Kennedy Co. and operations moved to St. Louis. Harry Rathbun (later law professor at Stanford) and Kennedy and others moved to St. Louis. Fuller was busy with carrier current telephone work with P G & E Co. and Great Western Power Co. and stayed in west. Portal went east for a time. Discussion of Great Western Power Co. Hal Elliot, Adrian Anderson both with Federal. Anderson now living in Saratoga, early ham operator.

160 Discussion of earthquake. Stanford boys rebuilding S.F. for six months. Carl Schultz a Federal engineer around 1928, moved east with them. Now in Palo Alto. Was official with ITT in New York.

192 De Forest with Federal, at 913 Emerson. Fuller discusses him. Edison-type inventor. Discussion of Charlie Logwood and his contribution to audion's amplification. Court records-litigation of Armstrong and de Forest discussed. De Forest not the first to have control of regeneration--Armstrong the first to have control of feedback. Fuller receiving a letter in his office in Hobart Bldg. in S.F. from Armstrong, then a student at Columbia, with messages copied from Federal's beach station.

275 Rasmussen mentions having a recording of Armstrong made at 50th anniversary of Radio Club of America. Discussion of Otis Moorehead.

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290 Moorehead tube plant across street from Kennedy Co. offices in Rialto Bldg. on New Montgomery and Mission. Moorehead formerly inspector with Marconi. Worked at World's Fair for de Forest. Started to build tubes, sued by de Forest. Pridham and Jensen with Federal, built moving coil loud speaker later at Napa.

335 More on Moorehead. "World's largest tube plant," 643 Mission St., S.F. Alvin Meyers, at one time with Herrold and de Forest; Mrs. Meyers later married Moorehead. Meyers retired admiral now. Was once manufacturer of tubes, sued by de Forest.

385 Discussion of round and tubular audions by de Forest. Perham has notes by Cunningham on early tube problems. Audiotron with external grid in Perham's collection, made by Moorehead and others.

418 Fuller discusses Emil Portal. Married an Auzerais girl. Kennedy Co. used garage on Auzerais estate for its broadcasting station. Portal operated the station after he and Fuller built it. Equipment used, about 1921-23.

455 Early S.F. broadcast stations. Tom Lambert of Sunnyvale Radio Shop, making ham equipment in 1921. Earl Borsch, early wireless man, later with Moorehead.

488 Fuller gives his biographical sketch. Radio ham in Portland, Oregon since 1906. Sent to S.F. by someone interested in Poulsen stock in 1910. Was shown the Beach Station and others. Graduated from Cornell in 1912. Worked for old Fessenden Co. in Brooklyn, N.Y. The National Electric Signalling Co. Sept 1, 1912 went to Federal. 1919-1923 in San Francisco with Kennedy Co. and PG&E, Great
531 Western Power Co. Then with General Electric Co. 1928 rejoined Federal, until 1932. 1930 was also professor of electrical engineering and head of the dept. at the University of Calif. at Berkeley. There until 1943. Then chief engr. at Joshua Ironworks plant in Sunnyvale. 1945--to Stanford University until 1954. 1919--received doctorate from Stanford. Research on high voltage lines with Ryan. Led to his later work with high voltage carrier current telephony--220,000 volts, longest distance in world, in early 20's.

579 Fuller a ham in Portland in 1906, also Carl Braun from Oregon City. Ned Heiskall also in 1911 call book. Both still active.

600 Robert Wolverton, radio inspector in S.F., with Federal during war. His son has cohererers and decoherers from early ~~Federal~~ wireless days. Father installed 500 kw arc stations in Cavite and at Pearl Harbor. Fuller and Wolverton worked together in New York at old Fessenden co. Fessenden was inventor of beat frequency or heterodyne reception. Fuller's experiments with miniature arcs to produce continuous oscillations. Used electrostatic headphones. Describes equipment and methods used for arc transmission. Discussion of radio frequency alternators.

Wolverton not Wolverton

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766 Discussion of the old Marconi Station at Marshall, Calif., used 1912-1920.

782 End of Dr. Leonard F. Fuller interview.

784 END OF TAPE 5, SIDE 2